

# PowerLine SL PV Series

## Laser beam sources for photovoltaic applications

The PowerLine SL laser series was specifically designed for scribing of photovoltaic and other electric thin-films. The applications include TCO/ITO/AZO layers on glass or flexible substrates, active layers on thin film modules like  $\alpha$ -Si/ $\mu$ -Si, CdTe and Cl(G)S, and the back contact layers like Al, Ag, Mo and combinations of such. The laser sources are available at 1064 nm (PowerLine SL 20 PV) and 532 nm (PowerLine SL 3 SHG PV).

Exceptional beam quality is crucial for laser scribing processes in order to maintain small scribe widths and constant depths. A large depth of focus, the result of high beam quality, enables the user to work through various material irregularities such as imperfect flatness and thickness of large glass panels. Pulse-to-pulse stability is key in maintaining elevated repetition rates during the high processing speeds. The refined temperature management system maintains lasting long-term stability and performance. These essential characteristics make the Powerline SL laser sources the processing tool for current and future thin-film applications.

Tight positional beam tolerances make the laser heads easily interchangeable, a strong advantage for integration. To support direct integration even further, compact cooling plates are available as options.

Also compact in design, the power supply unit fits easily into a 19" rack mount. The safety shutter and safety circuit incorporated into laserhead and supply unit are further simplifying direct integration, meeting EN-954-1/EN13849-1 standards.



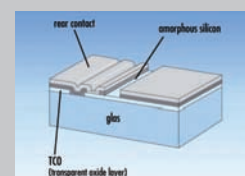
To provide an integration level even more advanced, ROFIN offers a wide range of accessories like beam expansions, beam benders, shaping elements and focusing units together with the Powerline SL series.

### Product features

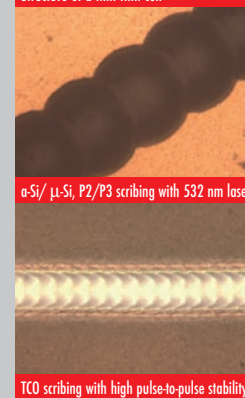
- superior beam quality
- excellent pulse-to-pulse stability, even at higher repetition rates
- exceptional long-term stability with temperature management system
- integrated shutter and safety circuit
- optional beam expansion built into the laser head

### Your Benefits

- laser source specifically designed for laser scribing applications
- compact OEM design for long-term stable 24/7 operation
- easy to integrate



Structure of a thin film cell

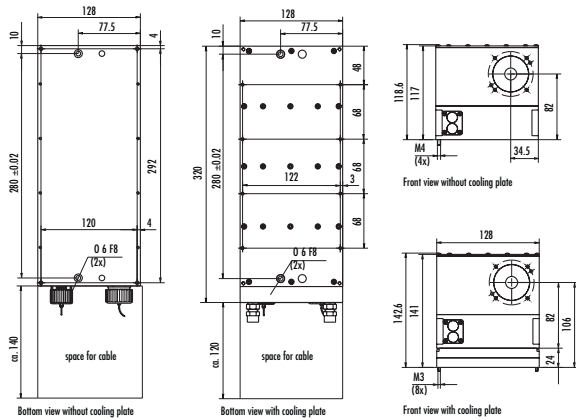


$\alpha$ -Si/ $\mu$ -Si, P2/P3 scribing with 532 nm laser

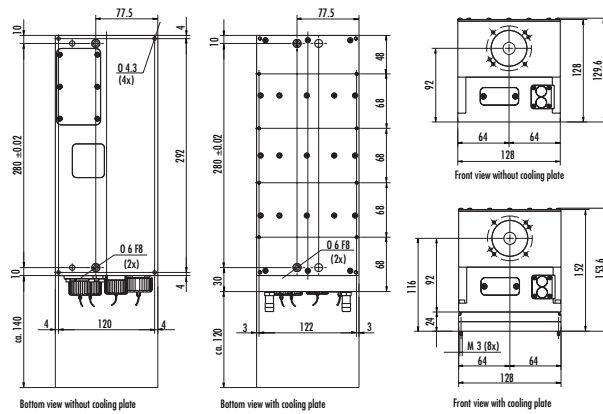
TCO scribing with high pulse-to-pulse stability

# PowerLine SL PV Series

**PowerLine SL 3 SHG PV**



**PowerLine SL 20 PV**



## Technical Data

	PowerLine SL 3 SHG PV	PowerLine SL 20 PV
<b>Beam Characteristics</b>		
Wavelength:	532 nm	1064 nm
Average power:	2.0 W	15 W
Pulse frequency:	15 – 400 kHz	0 – 400 kHz
Pulse width:	13 ns at 50 kHz	45 ns at 100 kHz
Beam quality:	TEM <sub>00</sub>	TEM <sub>00</sub>
M <sup>2</sup> :	< 1.2	< 1.2
Beam roundness*:	95%	95%
Focus symmetry within two Rayleigh ranges:	95% w/o beam expansion, 90% with beam expansion	90%
Energy per pulse:	40 µJ @ 50 kHz	150 µJ @ 100 kHz
Peak power:	3.0 kW @ 50 kHz	3.3 kW @ 100 kHz
Power stability during 8 h [rms, 1s]:	1% @ 50 kHz	1% @ 100 kHz
Pulse-to-pulse stability [rms, 1s]:	1.5% @ 50 kHz	1.5% @ 100kHz
Beam diameter approx.*:	1.0 mm w/o beam expansion, beam expansion: on request	1.0 mm w/o beam expansion, beam expansion: on request
Divergence (full angle) approx.*:	2 mrad w/o beam expansion	4 mrad w/o beam expansion
Polarization:	> 100:1 vert.	> 100:1 vert.
Boresight accuracy*:	+/- 0.3 mm, +/- 0.3 mrad	+/- 0.3 mm, +/- 0.3 mrad
Warm up time:	10 min.	15 min.
<b>Electrical connection</b>		
Voltage:	100 – 240 VAC +/- 10%; 1P/N/PE 50/60Hz	100 – 240 VAC +/- 10%; 1P/N/PE 50/60Hz
Power consumption max.:	140 VA	800 VA
Ambient temperature range:	15 – 35°C	15 – 35°C
Mounting plate temperature	20 – 35°C	20 – 25°C

\* value measured at beam aperture

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